

extensive occurrence in the ocean of frazil ice and anchor ice, each of which is rediscussed in the light of much additional information. Both fresh and salt water icicles are fully illustrated and explained, as are also the various types of ice floes, as the authors bravely (and correctly) call them, that form along the shore.

The mechanism of glacier motion is another of the reconsidered subjects, in which the merits and demerits of different explanations are considered. Those who found mental ease in the theory of fusion under high pressure and regelation under lower may be a bit disturbed by the concepts of crystal growth, free molecules, and varying vapor tension as contributors to the flow of glaciers. But the arguments advanced demand respect for these additional factors.

In so thoroughgoing a discussion the problem of giving names to the things described required careful consideration; hence we now have such terms as "continental ice," meaning an extensive sheet of ice so thick as to show little evidence of valley or hill beneath; "highland ice," also an extensive sheet, but thin enough to reveal the positions of all considerable ground irregularities; and so on through a goodly number of other names, including "cwm ice," meaning the ice in a cirque or bowl-like depression. But why, we wonder, this choice of an unlexiconed Welsh word *contra* its familiar Latin equivalent, especially when we haven't the slightest idea how to pronounce it?

The chapter on the structure of glaciers is delightful in its clear explanations of the origin of silt bands, some of which are more or less inclined—old fractures partially filled with windblown gravel and dust and then leaned far forward by the faster flow of the upper layers; also the blue or clear bands, resulting from shallow summer melting; white bands, caused by the collection of bubbles of air under the blue sheet; crevasses, and other structural peculiarities.

Fast ice, or ice beyond the shore but fast to the bottom, and the origin, westerly drift, and whole life history of the pack ice are also discussed in detail. The different kinds of icebergs, and the whole course of their disintegration, give material for an entire chapter. The tabular berg, a wandering ice plateau, sometimes over 100 feet high and 30 miles long, hence many fold the largest of all classes of icebergs, is peculiar to the Antarctic.

A final chapter of 53 pages is given to an illuminating discussion of the probable geological climates of the Antarctic. There is convincing evidence that at places the ice formerly stood 1,000 to 2,000 feet higher than it now does and also that it extended farther to sea. This, however, does not prove that the ice sheet formerly was 1,000 feet or more thicker over the whole of Antarctica. Perhaps the most interesting statement in this chapter is the belief of the authors that if the land of Antarctica were cleared of ice and nowhere was more than 1,000 feet above sea level the present snowfall could not result in glaciation; and that presently a relatively mild climate would prevail, much like that which pertained to Antarctica during most of the geological past.

The authors have also rendered fine service in bringing together in an appendix most of all that is known of the physical properties of ice.

Finally, the presswork, including the great number of halftones, is a model of excellence.—W. J. H.

## THE AIR AND ITS WAYS.<sup>2</sup>

By SIR NAPIER SHAW.

This octavo of xx, 237 pages, xxviii plates, and 100 figures, a collection of a number of lectures, is his answer, the author says, to certain questions asked him by school teachers.

It is to be hoped therefore that these teachers will read this answer carefully—much of it several times—and then ask Sir Napier a lot more questions. The preparation of such illuminating answers, and making them literature as well as science, is hard work, nevertheless there is no excuse where *noblesse oblige*.

The book begins with 24 original and most instructive world charts of rainfall, temperature, dew point, cloud, pressure, and wind. These, we are told, were prepared for that *Manual of Meteorology* the author has in preparation, and which we are expectantly awaiting.

Then follow the 15 lectures, starting with "Meteorology for schools and colleges," and ending with "The artificial control of the weather." Between these sections, however, almost the whole field of meteorology is discussed. There is no mathematics in any of these lectures, but for all that there are many places that require the closest sort of attention, and where training in physics and mathematics would materially aid the reader in getting a clear understanding of the author's meaning. And this was inevitable, since the obvious and controlling purpose of the author in all these lectures was "the bringing of the ascertained and coordinated facts about the weather into relation with each other and thereby with the laws and principles of physics."

Three of these principles have got into meteorology largely through the persistent and wholesome influence of our author. These are the fact that, in the sense used by Jean d'Alembert more than a century and a half ago, the air moves under balanced forces; that every mass of rising air is continually depleted by turbulence; and that owing to the increase of potential temperature with elevation each convectional height is limited as by a ceiling, slightly elastic, but strong beyond possible rupture.

As above implied, this book is not, nor was it intended to be, a systematic course in the science of meteorology; nevertheless, it can be recommended to the uninitiated who wish to know something of that ever-present phenomenon, the weather; and urged alike upon novice and master who, having learned little or much, are keen to know more of the air and its ways.—W. J. H.

## WEATHER IN EUROPE, JUNE, 1923.

From press reports that have appeared from time to time it is inferred that the month of June in Europe was attended by much cloud and rain and consequently little sunshine; low temperatures with frost in various parts of northern Europe and snow in the Alps also prevailed.

Subsequent reports show that in July high temperatures were experienced in England, France, Holland, Germany, and Italy.

All of this is merely saying that the weather of 1923 thus far has been characterized by great extremes rather than the steady change from season to season that is experienced in normal years.—A. J. H.

<sup>2</sup> Cambridge University Press, 1923.